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Using Practice Employment Tests in Recruitment and Selection to Equalize Preparation Opportunities

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ABSTRACT

Human resources (HR) managers struggle to manage the adverse impact-validity tradeoff where some of the most predictive and affordable hiring procedures, such as mental ability tests, often result in lower hiring rates for racioethnic minority subgroups of candidates, thus creating legal risks due to anti-discrimination laws. In this study, we examine whether employer-sponsored practice testing will reduce subgroup differences in test performance by offering an equalizing preparation opportunity framework based on the tenant of *access*, including access to information and opportunities to perform. In a large diverse sample in an operational selection context ($N_{\text{practice test}} = 29{,}626$; $N_{\text{actual test}} = 18{,}408$; $N_{\text{both}} = 5078$), we found that candidates who took the practice test scored higher on the actual tests than those who did not. All candidates benefitted by receiving an accurate estimate of passing the actual test and increasing their likelihood of applying. Further, racioethnic minorities realized greater score gains than racial non-minorities, thereby reducing subgroup mean differences and subsequent adverse impact. The results were supportive for all major racioethnic minority subgroups (Asians, Blacks or African Americans, and Hispanics), and effect sizes were meaningfully large. Finally, we examined differences in other preparation tactics (e.g., gaining additional experience, using study guides) and found that racioethnic minorities were likely to use some tactics more than racioethnic non-minorities, but not the most predictive tactics. We conclude that HR managers should consider equalizing preparation opportunities, specifically practice testing, to help address the adverse impact-validity tradeoff by reducing impact without abandoning valid employment tests.

1 | Introduction

One of the most fundamental challenges facing Human Resource (HR) managers in employee selection is that the most valid hiring procedures tend to show the greatest differences in scores between racioethnic subgroups, thus creating disparities in passing rates (i.e., adverse impact). Most notably, mental ability employment tests, as well as any hiring assessment or requirement that reflects cognitive skills, tend to have higher validity in predicting job performance, but also larger subgroup differences compared to non-cognitive assessments such as personality tests, work experience, interests, and references, which have much lower validity (e.g., Morgeson et al. 2007; Schmidt and Hunter 1998; Sackett et al. 2022). Adverse impact can lead to lawsuits alleging discrimination because it establishes a *prima facie* case of disparate impact under U.S. employment law and

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necessitates demonstrating job relatedness should it be challenged (Equal Employment Opportunity Commission, Civil Service Commission, Department of Labor, and Department of Justice 1978). Other selection procedures with higher validity and somewhat lower adverse impact, such as structured interviews and assessment exercises, tend to be too administratively costly for large-scale initial screening and thus, are not an affordable alternative in most situations. This creates a tradeoff for HR managers between high validity or low adverse impact, which has been labeled the adverse impact-validity dilemma (Ployhart and Holtz 2008). Often, HR managers must abandon the most predictive selection procedures to ensure a more diverse workforce or create legal risks for their organizations.

Efforts to reduce subgroup differences in employment assessments have focused primarily on the use of predictors with smaller subgroup differences, creating this dilemma (Ployhart and Holtz 2008). The effects of various strategies to reduce impact without changing the assessment approach (e.g., combining methods, changing test order, weighting tests differently, explanations, gamification, and many others) have often been small and inconsistent (van Iddekinge, Lievens, and Sackett 2023). While much of this research has intentionally or unintentionally assumed that candidate scores are fixed, recent scholarship has offered promising preliminary evidence that practice tests—or employer-sponsored, openly available practice assessments—may help reduce subgroup differences (Campion, Campion, and Campion 2019). Research shows employment test preparation can improve candidate test performance in general (Clause et al. 2001; Chung-Herrera et al. 2009). However, we argue that *access* to preparation has been unequal (e.g., coaching programs or reapplying and retesting; van Iddekinge, Lievens, and Sackett 2023).

Assuming candidate scores are fixed and continued unequal access to test preparation is problematic because organizations are thus not drawing from or drawing out the most promising talent. The importance of test preparation as a partial explanation of racioethnic minority[1] subgroup differences in school entrance exam performance has been a prevailing thesis in educational scholarship. Research shows that racial and ethnic differences in socioeconomic status are at least one distal cause of differences in test preparation opportunities (e.g., Briggs 2001; Buchmann, Condron, and Roscigno 2010; Dang and Rogers 2008; Sackett, Borneman, and Connelly 2008). Access to high-quality education and healthcare is less likely for those in lower socioeconomic levels, and people of color (particularly Black or African American and Hispanic individuals) are disproportionately represented in lower socioeconomic levels (Creamer 2020). As such, access to preparation may be less likely if it is costly, such as through coaching or classes outside of formal schoolwork. Employer-sponsored practice tests are a way to provide equal preparation opportunities to all candidates regardless of background.

To our knowledge, there has been a single prior study on the potential reduction of subgroup differences from an employer-sponsored practice test. In exploring a research question, Campion, Campion, and Campion (2019) found that Black or African American and Hispanic candidates had greater score gains on the actual mental ability employment test associated with taking the practice test than did the racioethnic nonminority candidates (White). However, their study raised several questions about the effectiveness of practice tests for improving diversity, which we aim to address in the current study: (1) whether the findings will replicate in subsequent samples and with all the larger racial subgroups (African American, Hispanic, and also Asian), (2) whether the score gains will reduce mean differences between subgroups, and (3) whether subsequent adverse impact (i.e., differences in passing rates) will be reduced because impact depends on many operational factors in addition to score differences (Arthur Jr. et al. 2013). As such, the purpose of this study is to constructively replicate these findings and conduct a much deeper examination of the effects of employer-sponsored practice tests to increase candidate pool quality and help reduce the adverse impact-validity tradeoff. We also go beyond Campion et al. by articulating a theoretical framework explaining why equalizing preparation opportunities such as the use of practice tests will reduce subgroup differences.

In achieving this purpose, we contribute to the literature in three ways. First, we provide a constructive replication of the limited previous research on the benefits of practice tests in employment by extending that research to focus specifically on understanding the diversity benefits in greater detail. A continued challenge for selection research is the adverse impact-validity dilemma wherein the strongest predictors of job performance tend to also display the largest subgroup differences, which often results in adverse impact (i.e., mental ability predictors; Ployhart and Holtz 2008). We extend this scholarship by building on the evidence of candidate practice in education (summarized in Sackett et al. 2001) to demonstrate the value of offering practice tests to reduce subgroup differences in employment test scores.

Second, we develop a preliminary theoretical framework around equal preparation opportunity and root our research in the idea of *access*, which refers to the ability of individuals to gain new information and have opportunities to perform. Practice tests, and other related preparation activities, offered equally to all potential candidates represent a meaningful form of access to employment. We draw from educational research on improving test performance through practice and contend that practice tests level the playing field for those with historically reduced access to resources that improve their likelihood of securing employment, while also demonstrating the value that access to practicing can offer to all candidates. We argue that racioethnic minority candidates will experience greater relative within-group score gains and receive accurate feedback on their likelihood of passing the actual employment test and be encouraged to apply to the same extent as nonminorities.

Finally, we empirically test our hypotheses using a large operational sample with mental ability tests, which are the employment procedure of most interest due to high validity but large subgroup differences. We test differences in actual adverse impact ratios between those who do and do not take practice tests. Differences in score gains will matter more to the extent that they result in improvement in the relative passing rates and thus job acquisition for racioethnic minorities, which is critical to

mitigate legal challenges to the selection process. The size and diversity of our sample also enable us to test whether there are meaningful Asian-White and Hispanic-White differences, in addition to testing Black or African American-White differences. Most studies have focused on Black or African American and White candidate comparisons and less frequently on Hispanic and White candidate comparisons, with few attending to Asian and White candidate comparisons (e.g., Roth et al. 2017). In doing so, we contribute to the literature aimed at understanding how organizations can participate in the generation and application of solutions to address discrepancies in opportunities by racial subgroups by focusing on low-cost and low-stakes organizational offerings that should improve access to employment.

2 | Theoretical Background

2.1 | Past Research on Test Preparation

There have been numerous reviews of the literature on test preparation for college entrance exams. Their conclusions vary somewhat on the overall effectiveness of test preparation, but they all show some meaningful improvement in test scores (e.g., Becker 1990; Briggs 2001; Kulik, Bangert-Drowns, and Kulik 1984; McGaghie, Downing, and Kubilius 2004; Montgomery and Lilly 2012; Powers 1985, 1993; Powers and Rock 1999). The presumed effectiveness of such programs for college admissions testing has spawned an industry of service providers. At least one estimate from 2012 suggests it was a billion-dollar industry in the United States at that time (Montgomery and Lilly 2012), which would likely be much greater today. Although there are many test preparation services for some licensing and certification examinations (e.g., for medical school, legal bar exam, accounting, real estate, human resources, and many other professions), similar providers of these services for employment tests do not widely exist. This is perhaps partly because the use of tests and the content of the tests are idiosyncratic by employers, thus requiring the organization to voluntarily sponsor the preparation. Nevertheless, the popularity of such services and research supporting the outcomes of test preparation in education suggests that employment test preparation may also be beneficial for job candidates if they have access to such resources.

Test preparation can take a variety of forms, ranging from so-called "test-wiseness" tricks to intensive classroom instruction on the specific knowledge or skill (Popham 1991; Smith 1991). Practice tests are only one type and are often part of broader preparation systems. In education, reviews suggest preparation in the form of simple advice about how to take tests and encouragement to increase motivation may help somewhat, but more intensive preparation to increase knowledge and skills can be much more effective (Becker 1990; Briggs 2001; Hermes et al. 2023; Kulik, Bangert-Drowns, and Kulik 1984; Montgomery and Lilly 2012; Powers 1993). When included, the specific effects of practice tests appear to be strong (e.g., Becker 1990; Kulik, Bangert-Drowns, and Kulik 1984).

Some companies are doing a better job of preparing candidates (e.g., Heineken[2], Mayo Clinic[3], Suzuno, 2019[4]). Practice tests are consistent with this trend to better prepare candidates but are more useful because they show candidates how well they might perform and be likely to get a job. They are an appealing form of preparation for employers interested in increasing subgroup differences in test scores because they are relatively easy and inexpensive to implement. Companies, including the one in the current study, can use retired versions of their actual employment tests. Further, they are analogous to allowing retesting, which is a common policy in organizations (usually after a reasonable period like 6 months or 1 year) but are less costly to the candidate and organization. Some research suggests retesting does not undermine test validity in predicting job performance and may improve it (Hausknecht, Trevor, and Farr 2002; Powers 1985; Stemig, Sackett, and Lievens 2015; van Iddekinge et al. 2011; van Iddekinge and Arnold 2017), which should similarly be the case for practice tests. Moreover, practice tests can focus on the selection procedures that measure constructs known for reflecting subgroup differences in selection (e.g., mental ability) that typically manifest as differences in hiring rates across subgroups (Arthur et al. 2013).

Despite the findings in the education literature, there has been much less research on subgroup differences in preparation in employment. The limited published research shows little evidence that preparation in general can help resolve the adverse impact-validity dilemma. For example, Ryan et al. (1998) found that Black or African American candidates were more likely to attend preparation sessions for a firefighter hiring exam, but attendance did not improve exam performance. Clause et al. (2001) found that self-reported preparation was related to police officer hiring exam performance, but no differences in preparation or gains by race. Chung-Herrera et al. (2009) found that Black or African American candidates did more self-preparation for a police promotional exam than White candidates, and preparation was related to test performance, but they did not find any differences in gains between Blacks and Whites. Notably, these studies did not include preparation in the form of practice testing.

2.2 | Linking Practice Tests to Past HR Research and Ongoing Trends

Some of the earliest literature in HR showing interest in helping minorities obtain employment goes back nearly 60 years (e.g., Blum and Schmidt 1966). Although the popular press notes that some large companies are reducing their diversity-enhancing initiatives (Ring 2024), a recent survey of HR executives suggests that there is still a strong sentiment to improve representation in organizations (e.g., Howland 2024). Such an orientation toward representation characterizes the latest era of research on employment discrimination. The evolution of philosophies on diversity and HR research has unfolded over four phases: (1) explicit discrimination against racioethnic minorities and women before the 1960s; (2) the passing of equal opportunity and civil rights laws and their initial impact in the 1960s to the 1980s, which focused on compliance as legally required; (3) diversity as a value-add to businesses in the 1980s to 2000s, which focused on how it might improve sales to diverse customers and increase creative ideas among other benefits; and (4) diversity as inclusion beyond just racioethnicity and gender from the 2000s to present. Nkomo and Hoobler (2014) provide a similar description and conclude that "when equal opportunity turned

toward diversity management, it became an ideology inclusive of all workers, with a focus more on the uniqueness of all and less on racism toward some. And the ideology of inclusiveness represents a return to color blindness, an idea introduced nearly 60 years ago" (p. 255). In their review of 60 years of discrimination and diversity research in *Human Resource Management*, Triana et al. (2021) echoed this idea: "focusing on diversity and inclusion is not a substitute for focusing on employment discrimination" (p. 186). They also conclude that their review leads to one certain outcome: more research needs to be conducted on reducing discrimination because it has waned recently with the focus instead on diversity and inclusion. Some organizations may be eliminating diversity and inclusion roles and units, but we argue all companies must retain a vigilant focus on subgroup differences in hiring given the legal ramifications of not doing so. For example, the Equal Employment Opportunity Commission received more than 81,000 complaints in 2023, up over 10% from the previous year.[5]

Indeed, research on discrimination in hiring suggests organizations still face significant challenges. For example, in their narrative review on resume audit studies, Adamovic (2022) shows that racioethnic discrimination is enduring. Resume audit studies are powerful indicators of ongoing discrimination in recruitment and selection because they use fake resumes and modify applicant characteristics—such as a name that may sound non-White—to test whether qualified (fake) applicants receive callbacks. In one study, Bertrand and Mullainathan (2004) found that resumes with White sounding names received 50% more callbacks than resumes with Black or African American. Changing attitudes at the individual recruiter level is a difficult goal, Calluso and Devetag (2024) note. Instead of focusing on such "i-frame" interventions that try to change the *individual* behavior of recruiters, organizations should implement "s-frame" interventions that focus on modifying *systems* that create standardization of practices to reduce recruiter bias (Derous and Ryan 2019). In addition to taking a systems-based focus, Ryan and Tippins (2004) showed how changing the characteristics of the candidate pool (such as number and quality of minority candidates) has the greatest influence on adverse impact (differences in passing rates between subgroups) compared to many other methods studied in past research.

Taken together, HR research on the eras of discrimination concludes that (1) focusing on inclusion efforts should not replace the focus on discrimination during hiring, (2) controlling for qualifications, discrimination during hiring is still occurring, (3) changing attitudes is more challenging than changing the system and systemic changes can focus on standardization that not only is more effective than attempting to change attitudes, but it also increases perceived fairness (e.g., Celani, Deutsch-Salamon, and Singh 2008; Cropanzano and Wright 2003), and (4) systematic changes can also influence the candidate pool, perhaps reducing impact by attracting higher-skilled racioethnic minority candidates. The use of practice tests offers at least a partial solution that addresses several of these issues. First, they retain focus on discrimination during hiring. Second, they rely on tests rather than recruiter judgment used in practices such as resume screening, which can avoid subjective bias because the scores can be used in a standardized manner. Third, they are an example of an s-frame intervention because they focus on the system rather than the individual decision makers. Fourth, they improve recruitment of highly skilled racioethnic minority candidates. Finally, practice tests can communicate a strong and valuable recruiting message about the candidate's chances of getting hired (Dineen and Williamson 2012), meaning such messages have the potential benefit to reduce costs by generating fewer but more qualified candidates, including racioethnic minority candidates.

2.3 | Test Preparation to Create Equal Preparation Opportunities

Past research on test preparation suggests that they may be effective because they create an *equalizing preparation opportunity* for racioethnic minority candidates by ensuring equal access. The American Psychological Association defines *access* as "the elimination of discrimination and other barriers that contribute to inequitable opportunities to join and be a part of a work group, organization, or community" (American Psychological Association 2021, 12). In education and organizational psychology research, access often includes (1) access to information, and (2) access to opportunities to perform (Dreher and Cox Jr 1996; Roberson 2019). Unequal access to information on testing and opportunities to prepare for and perform in high-stakes testing offers insight into prevailing racial subgroup differences on employment tests. We argue that an intervention to equalize access to information and preparation opportunities, focusing specifically on employer-sponsored practice tests, should reduce subgroup differences.

The research on test preparation in education, especially preparation for college entrance exams, shows that racioethnic minorities are *more* likely to prepare than nonminorities. For example, Buchmann, Condron, and Roscigno (2010), Devine-Eller (2012), and Ho, Park, and Kao (2019) found that Black or African American and other racioethnic minority high school students were much more likely than White students to utilize most types of college test preparation strategies. This research suggests racioethnic minorities from comparable backgrounds to nonminorities, in terms of parental income and education, take advantage of test preparation more. Buchmann, Condron, and Roscigno (2010) reasoned that these findings were at least in part because Black or African American students and their families are sensitized to the historically lower test scores of racioethnic minority students and are therefore more motivated to prepare. Likewise, in graduate education, Gely et al. (2022) found that racioethnic minorities attempted the Medical College Admissions Tests more than racioethnic nonminority students. Retesting is one way to practice and has shown some success in reducing subgroup differences (Sackett et al. 2001), but limited research in employment has found racioethnic non-minorities may gain from retesting more (e.g., Schleicher et al. 2006).

While we argue that findings on test preparation from the education literature should generalize to employment testing, there are important differences between testing in higher education and testing in organizations making such generalizations uncertain. Educational test preparation has clear, known, and widely used targets (e.g., SAT, ACT, and GRE) for which there are many preparation services available. Meanwhile, employment test

preparation is opaque to most candidates, in part because selection practices differ greatly by organization. Many do not use tests and, if they do, it is likely a different test than other employers. Tests used will probably not be known to candidates, and there are no services or other forms of preparation available.[6] It may also be that perceptions of discriminatory selection practices are greater in employment (e.g., Avery and McKay 2006; Gonzalez et al. 2021) than in education, which may reduce interest or confidence in test preparation, even if it were available.

Nevertheless, the idea of access to information and the opportunity to perform as challenges in equalizing opportunities among the diverse population in the U.S. is documented in education and organizational literature. For example, indicators of socioeconomic background are significant determinants of educational test preparation. Students with higher family incomes and more educated parents who attended high schools with more advanced placement courses, among other socioeconomic advantages, are more likely to prepare for tests (e.g., Buchmann, Condron, and Roscigno 2010; Park and Becks 2015). As such, although racioethnic minorities who have comparable socioeconomic means as racioethnic nonminorities participate in college test preparation more, there will still likely be race differences across the entire population due to average differences in socioeconomic background (e.g., Cottrell, Newman, and Roisman 2015). In organizational research, we find there are differences along racial lines in access to information and opportunities to perform (e.g., Dreher and Cox Jr 1996; Ibarra 1993; McDonald, Lin, and Ao 2009). As Dineen et al. note in a recent review, "Minority and under-represented groups may not have equal access to recruitment sources and information, which may compromise their ability to choose among employers" (Dineen, Yu, and Stevenson-Street 2023, 22). The limited evidence on organizationally sponsored test preparation in employment where access is equal suggests minorities may take advantage of it to a greater extent (e.g., Chung-Herrera et al. 2009; Ryan et al. 1998), although this may not always be observed (e.g., Clause et al. 2001).

Practice tests offer an equalizing experience to improve potential candidates' information on the selection process and increase their opportunities to perform. The previous study by Campion, Campion, and Campion (2019) found several other reasons practice tests may be effective for reasons related to equalizing preparation opportunities. First, not only do they provide information to candidates about the hiring process and their likelihood of getting a job, but they also encourage more skilled candidates to apply to the organization, and they provide guidance on ways candidates can improve their skills, among perhaps other benefits (Campion, Campion, and Campion 2019). Second, unlike gaining degrees, work experience, or other preparation to improve employment prospects that may take years and are costly, practice tests can increase scores by a meaningful increment with only a modest time investment (in the current organization, it takes about 1 h). Third, practice tests are also more immediately available and less costly than retesting but may provide similar gains. Fourth, some skills can be improved quickly because of relearning. For example, they observed more improvement on an English expression test than a knowledge test. They suggested this may be due to helping candidates relearn or remember basic grammatical skills, which can occur through taking the test, while job knowledge was improved less because the domain was much larger.

3 | Hypothesis Development: Influence of Practice Tests on Diversity in Hiring

Research on practice testing in education (Montgomery and Lilly 2012; Powers 1985) and the limited research in employment (Campion, Campion, and Campion 2019) show that regardless of racioethnicity, individuals who participate in preparation via practice testing tend to score higher on the actual test than those who did not. We aim to replicate and extend this research and therefore hypothesize this relationship as a baseline:

Hypothesis 1. *Candidates who take practice tests will score higher on the actual test than those who do not take practice tests.*

Building on the theoretical pillar of equalizing access, we contend that racioethnic minorities will likely experience greater gains from test preparation than racioethnic nonminorities. There are two primary reasons to expect this. First, although previous research on employment test retesting showed that racioethnic nonminorities may gain more than racioethnic minorities (Schleicher et al. 2010; van Iddekinge et al. 2011), previous research on employment practice tests showed racioethnic minorities may gain more (Campion, Campion, and Campion 2019). Given the much greater availability of practice tests, which any candidate can access, as opposed to retesting where the candidates may have to pass prescreens, we expect that evidence is more relevant. Second, practice testing should offer greater gains to racioethnic minorities through the tenet of equal access to new information about the employment test. Unlike educational testing preparation, occupationally specific employment test preparation is less influenced by current financial resources enabling preparation. While students who come from wealthier backgrounds tend to (1) engage in meaningful and costly preparation for standardized educational tests, and (2) score higher on standardized educational tests (Buchmann, Condron, and Roscigno 2010; Dahlke, Sackett, and Kuncel 2023), there are not widespread test preparation services available for individual employers outside licensure and certification exams for limited professions and some large-scale employers (e.g., military). A person's socioeconomic background should not predict their access to employment practice tests. Instead, organizations that offer practice testing and materials freely and equally to all potential applicants will equalize the preparation playing field regardless of candidate resources. As such, we hypothesize:

Hypothesis 2. *Racioethnic minorities will realize greater score gains between their practice test and actual test scores than racioethnic nonminorities.*

In existing studies, researchers tended to focus on comparisons between races (Campion, Campion, and Campion 2019; Schleicher et al. 2010; van Iddekinge et al. 2011), leaving uncertainty as to (1) within-group score differences and (2) the actual reduction of between-group differences. While helping candidates improve their scores is an important outcome for individuals, reducing subgroup differences is an important benefit for the organization because of implications for adverse impact.

As such, it is important to demonstrate both benefits. Following from previous scholarship and Hypothesis 2, we hypothesize

Hypothesis 3. *Racioethnic minorities who take the practice test will have higher scores on the actual test than those who do not take the practice test, and these within-group differences will be larger for racioethnic minorities than racioethnic non-minorities, thereby reducing subgroup differences.*

Reductions in subgroup differences do not always yield reductions in adverse impact due to additional considerations such as selection ratios, score distributions, and other factors unique to the hiring context. Despite the influence of these factors in each context, we hypothesize an influence of practice tests on adverse impact because, holding those other factors constant, there are two conceptual reasons to expect a reduction in impact. First, because practice tests should increase the scores for all subgroups of candidates to some extent, all passing rates will be higher (assuming a constant passing score), which will reduce adverse impact because the ratio of passing rates (which is the operational definition of adverse impact) will also be larger. For example, let's assume the passing rate for racioethnic minorities is 40% while the passing score for nonminorities is 50%, yielding an adverse impact ratio of 0.80 (40% divided by 50%). If the use of practice tests increased the passing rates for both groups by 5%, the adverse impact ratio would be 0.82 (45% divided by 55%). This is analogous to a "rising tide lifts all boats."[7] Second, practice tests encourage candidates with higher scores to apply to the organization (as demonstrated by Campion, Campion, and Campion 2019, and replicated to confirm in the current study), so the pools of both racioethnic minority and racioethnic nonminority candidates should have higher scores leading to reduced impact. We argue this happens not only due to a rising tide effect, but also because the initially lower scores of racioethnic minority candidates should improve more through practice tests because they have a larger average potential for score gains due to lower initial scores (as noted by Schleicher et al. 2006). This reinforces the observation of Newman and Lyon as to the "primacy of applicant pool characteristics for resolving adverse impact" (Newman and Lyon 2009, 298; also noted by Ryan and Tippins 2004), as opposed to a focus on changing the personnel selection procedures, which can have the unintended consequence of reducing validity (Ployhart and Holtz 2008). Therefore, we hypothesize

Hypothesis 4. *Adverse impact for racioethnic minorities will be reduced for those who take the practice test compared to those who do not.*

In supplemental analyses, we explore the use of other types of preparation through a survey that accompanied the practice test. For example, candidates may review descriptive information on the hiring process on the organization's website, speak with current employees or recruiters, take courses related to the occupation, or gain relevant work experience. A notable finding in the education literature is that racioethnic minorities with comparable financial means are more likely to participate in educational test preparation (Devine-Eller 2012; Ho, Park, and Kao 2019); however, some have posited that despite participating in more types of preparation than racioethnic nonminorities (Alon 2010), racioethnic minorities may engage in less effective types of preparation. In two laboratory studies on test-taking strategy predictors of cognitive test performance (Dollinger and Clark 2012; Ellis and Ryan 2003), Black or African American students more frequently used less effective test-taking strategies than White students (e.g., advice on which alternative answer to pick when guessing), and some of the variance in subgroup test performance was due to differences in the effectiveness of these strategies. It is important to note that these studies only looked at test-taking strategies defined as advice on how to take tests, not actual preparation that may improve underlying skills. While our theorizing might suggest that increased access should increase use by all races, findings from education suggest that the use of more effective preparation types may vary by racioethnic subgroups. Supplementary analyses based on survey responses explore these differences.

4 | Methods

4.1 | Procedure

The practice test used in this study is a completely retired version of the tests used by the organization, although practice tests could be constructed of past items as well. The test is the first stage of the hiring process, which candidates can access by applying online and then going to a testing center to take the test in proctored conditions.[8] The test is given three times per year for two-week periods, and there are no prescreening conditions other than completing the application to register, being a U.S. citizen, and going to one of the hundreds of testing centers that are located throughout the U.S. Candidates can only repeat the test once per year, however. The practice test is not a condition of application. It is offered on the organization's website as a test preparation tool applicants can take voluntarily. It is anonymous to the organization and only applicants receive their scores and information regarding their likelihood of passing the actual tests. Because the practice test is equivalent in all manner to the actual tests (e.g., content, length, online format, and instructions), the scores achieved reflect an estimate of the scores on the actual tests with good probability. Moreover, because the practice test was a previous actual test, extensive normative data allowed an accurate estimate of passing the actual tests. Test feedback includes whether they passed each subtest and the composite of the practice test (based on a 50% passing rate) and the probability (as a percentage) of passing the composite on the actual tests. Because there is a margin of error, passing the practice test does not ensure passing the actual tests, but higher scores increase the likelihood, as explained to the candidates.

Interested potential applicants do not have to actually apply for a job or provide any information to take the practice test. They can take the test anytime by accessing a link posted on the organization's website. No identifying information is required. However, if they would like to track their scores to measure improvement by taking the test again, or to log back in to resume if they lost computer connectivity or could not finish the test in one sitting, they are allowed to enter their e-mail address (of which 68.55% did).

The instructions were modeled after the actual test administration to provide the same experience of the actual testing process

and the best estimate of the score. They state the time for each subtest and that the timer cannot be stopped once beginning. They tell applicants to take the test as though they were taking the actual tests by allocating sufficient uninterrupted time to complete the test, and to take the test at a time when they are alert and prepared.

To further promote learning from taking the practice test, applicants are allowed to review the questions and correct answers after taking the test. The website also offers additional preparation guidance and resources (e.g., test information guide, description of the hiring process, suggested classes and readings, and access to recruiters). The recruiting website tells potential applicants that the practice tests may give them the confidence and motivation to move forward with their application. They are also told that if they do not perform well, they could improve their score by studying and taking the practice test again. Either way, experiencing the practice test should make them better prepared, which should increase their score and also reduce test anxiety somewhat, and it is much more convenient than taking the actual test to learn about it.

4.2 | Participants

Participants were applying for entry-level positions in a professional occupation in a U.S. government agency. As part of the entrance exam, all individuals take the same battery of employment tests. The organization would not allow us to identify the occupation because this is a current hiring program. The occupation consists of multiple job areas that include operations and policy work, and skills ranging from management to political science. Incumbents are generalists who are transferred often and expected to work in any of these job areas as the needs of the organization require. Thus, all recruiting and hiring procedures are the same.

The organization focuses extensively on increasing the number of racioethnic minority applicants. These efforts double the percentages of racioethnic minority candidates compared to the relevant labor market for this occupation.[9] The recruiters for this organization, who devote most of their attention to racioethnic minority recruiting, requested that a practice test be developed to encourage hesitant candidates to apply and to reduce candidate disappointment if they are not prepared, thus enhancing affirmative-recruiting success.

We only retained practice test data for participants who provided an email, got at least 25% correct, which was the level of chance with the four-option multiple-choice questions, and completed both tests, as indicated by clicking through all the pages. We allowed up to 50% of items per test to be skipped. These rules helped ensure only legitimate scores were included for several reasons. First, they ensured that participants reviewed all the items, attempted most, and did not respond randomly. Second, some scores on the actual tests are this low. Third, because the purpose is to allow candidates a realistic preview of the nature of work in this occupation to evaluate whether they should apply, some may realize they have little relevant knowledge after starting the practice tests and thus not finish. This resulted in a final sample of 29,626 practice test takers during the period of this study (2014–2018).

Sample characteristics are reported in Table 1. There were 18,408 candidates who took the actual test during this time period, of which 5078 took both a practice test and subsequently the actual test that could be matched based on e-mail addresses from the major racioethnic subgroups. The number of matches was influenced by some candidates deciding not to apply, some not really intending to apply who took the practice test out of curiosity, and some candidates taking the actual test outside the study period. Statistical power exceeded 90% for all hypothesis tests for even small effect sizes.

Demographic data were collected at the time of the actual test, not the practice test. The total sample taking the actual test ($N = 18{,}408$) was 9.85% ($N = 1814$) Asian, 9.29% ($N = 1710$) Black or African American, 12.00%% ($N = 2209$) Hispanic or Latino, 2.04% ($N = 375$) other racioethnic groups too small to analyze or did not report, and 66.82% ($N = 12{,}300$) White, with 35.91% ($N = 6611$) women. The sample taking both the PT and the actual test ($N = 5708$) was 9.00% ($N = 457$) Asian, 7.68% ($N = 360$) Black or African American, 10.61% ($N = 539$) Hispanic or Latino, 2.17% ($N = 110$) other racioethnic groups too small to analyze or did not report, and 70.54% ($N = 3582$) White, with 31.69% ($N = 1809$) women. Because the demographic information is collected at the time of the actual test, the racioethnic breakdown of those who did not take the actual test cannot be known. However, other surveys of candidates in this organization show that relatively fewer racioethnic minorities take the practice tests, or they do not report their email addresses in the practice test, which is required to match their practice test with their actual test scores and demographic data. Moreover, it is likely that a greater portion of missing data are racioethnic minorities (Lor et al. 2017; Steele and Aronson 1995). Although the data set does not contain educational level, historically the applicants nearly all had an undergraduate degree (99%), and most had a master's degree or greater (70%).

4.3 | Measures

4.3.1 | Actual Test Scores

The actual tests consist of two subtests—occupational knowledge and English writing. Together, these create a total score. These constitute the first hurdle of the hiring process. The tests are based on comprehensive job analyses, which are converted into test-specification plans to ensure content validity. For the *actual occupational knowledge subtest*, the specification is based on 20 knowledge areas that are common to all job areas such as economics, management practices, and governmental processes. It contains 50 multiple-choice items that are scored as correct (1) or incorrect (0). The *actual English writing skills subtest* is a job sample based on examples of text from the job, and candidates must identify the correct grammar, punctuation, structure, word usage, and other aspects of written English. It contains 45 multiple-choice items, which are scored as correct (1) or incorrect (0). Internal consistency reliabilities for both

TABLE 1 | Sample characteristics.

		Racioethnic group									
		Asian		Black or African American		Hispanic		White		Racioethnic groups too small to analyze or did not report	
Sample	***N***	***N***	**%**	***N***	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Took practice test	29,626										
Took practice test only	24,548										
Took practice and actual test	5078	457	9.00%	390	7.68%	539	10.61%	3582	70.54%	110	2.17%
Took actual test	18,408	1814	9.85%	1710	9.29%	2209	12.00%	12,300	66.82%	375	2.04%
Took actual test only	13,330	1357	10.18%	1320	9.90%	1670	12.53%	8718	65.40%	265	1.99%

Note: Data on test takers' race were not collected while taking the practice test.

tests average approximately 0.90, and intercorrelations average about 0.60. Test equivalence over time is maintained by using the same test specification plan and matching on average item difficulty. Scores are converted to T-scores to ensure that the means and standard deviations were the same and summed to create a combined score (*actual test total score*). Finally, *took actual test* is coded as 1 if they took the actual test and 0 if they did not. If applicants took the actual test multiple times, we only used the scores from their first test. The actual test takes about an hour to complete.

4.3.2 | Practice Test Scores

Because the practice tests are retired versions of the actual tests, all measurement information in the "Actual Tests" subsection immediately above is applicable here. Practice test scores include *practice test occupational knowledge subtest*, *practice test English writing skills subtest*, and *practice test total score*. *Took practice test* is coded as 1 and 0 if they did not. If potential applicants took the practice tests multiple times, we used their first scores for our analyses. We excluded participants who took the actual test before taking the practice test because past research has shown that it can have an equivalent effect on the practice test (Campion, Campion, and Campion 2019). The practice test takes about 1 h to complete.

4.3.3 | Differences Between Practice and Actual Test Scores

Differences were estimated by subtracting the practice test scores from the actual test scores on each subtest as well as the total test scores.

4.3.4 | Additional Test Preparation

A brief survey was included at the beginning of the practice test that asked about 10 other forms of test preparation: using the test information guide, reading the guide to the organization's hiring process, reviewing information on the organization's website, reviewing related test questions on the topic that are on a mobile application (these are not part of the practice test, nor are they retired test questions), reading a book or books related to the test topics, taking a course or courses related to the test topics, attending a test information session, seeking advice from a recruiter, obtaining job experience related to the test topics, and obtaining other (non-job) experiences related to the test topics. The survey precedes the test questions so that responses are not influenced by test performance. Responses to the type of preparation are scored yes (1) or no (0). We also calculated a *preparation index*, which is a sum of the number of additional preparation activities they engaged in, and it ranges from 0 to 10.

4.3.5 | Race

Participant race data were only collected from those who completed the actual test and were provided voluntarily. These data were coded as 1 if they indicated they were a race and 0 if they were not. There were sufficient data to analyze the following racioethnic groups: Asian, Black or African American, Hispanic, and White. Those who reported multiple races were usually Hispanic and White, which were coded as Hispanic. We focused on these subgroups because research suggests these tend to show the largest subgroup differences (e.g., Hough, Oswald, and Ployhart 2001; Roth et al. 2017). Specific comparisons were analyzed separately (i.e., Asian vs.

White, Black or African American vs. White, and Hispanic vs. White).

5 | Results

Data were analyzed using IBM SPSS Statistics (v. 29). Means, standard deviations, and descriptive statistics are in Table 2, yielding several observations. First, scores on the practice test positively relate to scores on the actual test (Total Scores $r = 0.73$, $p < 0.001$), and how a participant performs on the practice test (total score) positively predicts whether they will take the actual ($r = 0.21$, $p < 0.001$). Second, there is more variance (as reflected in higher standard deviations) in the practice test scores than the actual test scores. This makes sense because practice tests offer diagnostic information to potential candidates as to their preparedness for the actual test, so lower performers either do not take the actual test or gain additional knowledge or skills through a variety of preparation tactics before taking the actual test. Finally, all preparation types positively related to whether a candidate took the actual test, but not all of the preparation types positively related to actual test scores.

5.1 | Tests of Hypotheses

Hypothesis 1 predicted that candidates who take the practice test will score higher on the actual tests than those who do not. We test this hypothesis in two ways. First, the bivariate correlation between whether they took the practice test and their scores on the actual test are positive: $r_{\text{occupational knowledge}} = 0.06$, $p < 0.001$; $r_{\text{English writing skills}} = 0.09$, $p < 0.001$; and $r_{\text{total score}} = 0.09$, $p < 0.001$ (Table 2). Second, we examine the mean difference in actual test scores between those who did and did not take the practice test. Table 3 shows support in that those who took the practice test scored higher on the actual test than those who did not take the practice test on the actual occupational knowledge subtest ($M = 52.50$, $SD = 7.83$, and $M = 51.45$, $SD = 8.51$, respectively; $t(18{,}406) = 7.92$, $p < 0.001$, $d = 0.13$), the actual English writing skills subtest ($M = 53.26$, $SD = 7.29$, and $M = 51.64$, $SD = 7.85$, respectively; $t(18{,}406) = 13.19$, $p < 0.001$, $d = 0.21$), and the actual total score ($M = 105.76$, $SD = 13.16$, and $M = 103.10$, $SD = 14.38$, respectively; $t(18{,}406) = 11.97$, $p < 0.001$, $d = 0.19$). Hypothesis 1 is supported.

Because the purpose of Hypothesis 1 was to establish a baseline replication of the previous findings of Campion, Campion, and Campion (2019), we also confirmed the other core findings from that study. First, that study showed that another benefit to candidates is obtaining an accurate estimate of their likelihood of passing the actual test, which we replicate and extend here by examining subgroup differences. Table 4 shows that the correlations between the practice test and the actual test are as large or larger for racioethnic minorities, and significantly higher for all three subgroups on the actual English writing skills subtest. Asian and Hispanic candidates also have a higher correlation on the total score.

Second, the previous study showed that a further benefit is encouraging higher-scoring candidates to take the actual test, which we again replicate and extend here by examining subgroup differences. Table 5 shows that scoring higher on the practice tests increased the likelihood of taking the actual test for the total group ($r = 0.21$, $p = < 0.001$) and there is a clear trend of percent taking the actual test based on their score on the practice test. This could only be tested indirectly by subgroup because race data were not collected on the practice test. Therefore, we examined the likelihood of having taken the practice test based on the score on the actual test by racioethnic subgroup. As shown in Table 6, there is a clear but imperfect trend for each subgroup. Those who scored higher on the actual test had a greater likelihood of having taken the practice test, suggesting that the better they did on the practice test, the more likely they were to take the actual test because the practice and actual test scores are highly correlated as reported above. Moreover, the increasing trend is similar between the racioethnic subgroups and the White subgroup. The correlation between the increasing percentages in Table 6 is 0.71 for Asian-White comparisons, 0.48 for Black or African American-White comparisons, and 0.60 for Hispanic-White comparisons. However, White candidates in the middle score ranges are somewhat more likely to take the actual test than racioethnic minorities, perhaps suggesting racioethnic minorities need greater assurance of success to be encouraged to apply.

Hypothesis 2 predicted that racioethnic minorities will realize greater score gains between their practice and actual test scores than racioethnic non-minorities. We tested this by analyzing the differences in relative score gains by comparing each racioethnic minority subgroup with the White subgroup and expressing these differences using Cohen's d (Table 7; Table A, Supporting Information). We found that Asian, Blacks or African American, and Hispanic candidates all realized greater gains in their English writing skills subtest score than White candidates ($d = 0.21$, $p < 0.001$; $d = 0.43$, $p < 0.001$; and $d = 0.18$, $p = < 0.001$; respectively), but Asian and Black or African American candidates did not realize greater gains in their occupational knowledge subtest scores than White candidates ($d = 0.04$, $p = 0.47$; and $d = 0.00$, $p = 0.46$; respectively) and Hispanic candidates experienced fewer gains ($d = -0.12$, $p = 0.03$). Finally, we found significant differences in actual total scores between Asian and White candidates ($d = 0.18$, $p < 0.001$), and Black or African American and White candidates ($d = 0.31$, $p < 0.001$), but not Hispanic and White candidates ($d = 0.06$, p 0.30). Therefore, Hypothesis 2 is largely supported.

Hypothesis 3 predicted that racioethnic minorities who take the practice test will have higher scores on the actual tests than those who do not take the practice test, and that these within-group differences will be larger for racioethnic minorities than racioethnic non-minorities thereby reducing subgroup differences. We tested this by investigating the mean subgroup score differences on the actual test between those who took and those who did not take the practice test. For the actual English writing skills subtest, Table 8 (see also Table B in Supporting Information) shows that Asian ($d = 0.26$, $p < 0.001$) and Hispanic ($d = 0.32$, $p < 0.001$) candidates who took the practice test had significantly greater increases in actual test scores than candidates from their racioethnic group who did not take the practice test as compared to White ($d = 0.19$) candidates. For the actual occupational knowledge subtest, Black or African American ($d = 0.14$, $p = 0.02$) and Hispanic ($d = 0.17$,

TABLE 2 | Means, standard deviations, and intercorrelations.

Variables	Mean	SD	N	1	2	3	4	5	6	7	8
Actual test											
1. Took actual test	0.43	0.50	42,956	—							
2. Actual test occupational knowledge subtest score	51.74	8.34	18,408	[a]	—						
3. Actual test english writing skills subtest score	52.09	7.73	18,408	[a]	0.54**	—					
4. Actual test total score	103.83	14.10	18,408	[a]	0.89**	0.87**	—				
Practice test											
5. Took practice test	0.69	0.46	42,956	−0.78**	0.06**	0.09**	0.09**	—			
6. Practice test occupational knowledge subtest score	47.70	9.61	29,626	0.18**	0.63**	0.46**	0.63**	[a]	—		
7. Practice test english writing skills subtest score	53.29	13.35	29,626	0.19**	0.48**	0.64**	0.64**	[a]	0.61**	—	
8. Practice test total score	100.98	20.64	29,626	0.21**	0.63**	0.65**	0.73**	[a]	0.86**	0.93**	—
Difference between practice and actual											
9. Difference between practice and actual occupational knowledge subtest scores	1.03	6.61	5078	[a]	0.48**	0.09**	0.33**	[a]	−0.39**	0.02	−0.18**

(Continues)

TABLE 2 | (Continued)

Variables	Mean	SD	N	1	2	3	4	5	6	7	8
10. Difference between practice and actual English writing skills subtest scores	−5.73	7.57	5078	[a]	−0.13**	0.14**	0.00	[a]	−0.19**	−0.67**	−0.54**
11. Difference between practice and actual total scores	−4.70	10.37	5078	[a]	0.21**	0.16**	0.21**	[a]	−0.39**	−0.48**	−0.51**
Preparation type											
12. Used test information guide	0.15	0.36	29,626	0.12**	−0.07**	−0.08**	−0.08**	[a]	−0.02**	−0.05**	−0.04**
13. Read organization's hiring process guide	0.37	0.48	29,626	0.17**	0.00	0.03*	0.01	[a]	0.02**	0.08**	0.06**
14. Reviewed information on organization's website	0.43	0.50	29,626	0.17**	0.02	0.05**	0.04**	[a]	0.04**	0.10**	0.08**
15. Reviewed retired test question on mobile app	0.09	0.28	29,626	0.17**	0.00	0.03	0.02	[a]	0.05**	0.06**	0.06**
16. Read book(s) related to test topics	0.20	0.40	29,626	0.19**	0.05**	0.04**	0.05**	[a]	0.09**	0.09**	0.10**
17. Took course(s) related to test topics	0.13	0.34	29,626	0.14**	0.07**	0.06**	0.07**	[a]	0.09**	0.11**	0.11**
18. Attended test information session	0.02	0.14	29,626	0.03**	0.00	−0.01	0.00	[a]	−0.02**	−0.02**	−0.02**
19. Sought advice of a recruiter	0.09	0.29	29,626	0.12**	−0.06**	−0.03*	−0.05**	[a]	−0.01	0.03**	0.02**
20. Obtained job experience related to test topics	0.18	0.39	29,626	0.10**	0.07**	0.09**	0.09**	[a]	0.08**	0.08**	0.09**

(Continues)

TABLE 2 | (Continued)

Variables	Mean	SD	N	1	2	3	4	5	6	7	8
21. Obtained non-job experience related to test topics	0.15	0.36	29,626	0.04**	0.02	0.04**	0.04*	[a]	0.01	0.00	0.00
22. Preparation type index	1.83	1.84	29,626	0.26**	0.02	0.05**	0.04**	[a]	0.07**	0.11**	0.10**

Variables	9	10	11	12	13	14	15	16	17	18	19	20	21
Difference between practice and actual													
9. Difference between practice and actual occupational knowledge subtest scores	—												
10. Difference between practice and actual English writing skills subtest scores	0.07**	—											
11. Difference between practice and actual total scores	0.69**	0.77**	—										
Preparation type													
12. Used test information guide	−0.04*	0.00	−0.02	—									
13. Read organization's hiring process guide	−0.01	−0.04**	−0.03*	0.25**	—								
14. Reviewed information on organization's website	0.00	−0.07**	−0.05**	0.18**	0.54**	—							
15. Reviewed retired test question on mobile app	−0.01	−0.03*	−0.03*	0.28**	0.27**	0.26**	—						
16. Read book(s) related to test topics	0.00	−0.03*	−0.02	0.24**	0.26**	0.28**	0.26**	—					
17. Took course(s) related to test topics	0.01	−0.04**	−0.03	0.10**	0.18**	0.20**	0.15**	0.49**	—				
18. Attended test information session	0.01	−0.01	0.00	0.09**	0.07**	0.07**	0.12**	0.09**	0.10**	—			
19. Sought advice of a recruiter	0.00	0.00	0.00	0.11**	0.15**	0.17**	0.15**	0.17**	0.13**	0.17**	—		
20. Obtained job experience related to test topics	0.01	−0.02	−0.01	0.06**	0.14**	0.16**	0.12**	0.19**	0.18**	0.06**	0.16**	—	
21. Obtained non-job experience related to test topics	0.01	0.01	0.01	0.00	0.05**	0.05**	0.05**	0.10**	0.11**	0.03**	0.08**	0.27**	—
22. Preparation type index	−0.01	−0.05**	−0.04**	0.46**	0.65**	0.66**	0.50**	0.63**	0.52**	0.23**	0.41**	0.48**	0.34**

Note: Correlation sample size ranges from 5078 to 29,626.

[a]Not computed because one variable is constant. All participants who indicate a race took the actual test, all participants who had an actual test score took the actual test, all participants who had a practice test score took the practice test, and all participants who indicated preparation type took the practice test.

TABLE 3 | Mean comparisons and *t*-tests of actual test scores comparing those who took and did not take the practice test.

	Took practice test			Did not take practice test					
	N	**Mean**	**SD**	***N***	**Mean**	**SD**	***t*-test**	***p*-value**	***d***
Actual test total score	5078	105.76	13.16	13,330	103.10	14.38	11.97**	<0.001	0.19
Actual test occupational knowledge subtest score	5078	52.50	7.83	13,330	51.45	8.51	7.92**	<0.001	0.13
Actual test English writing skills subtest score	5078	53.26	7.29	13,330	51.64	7.85	13.19**	<0.001	0.21

Note: $^{**}p < 0.01$, $^{*}p < 0.05$ (one-tailed).

TABLE 4 | Correlations between practice and actual test scores by racioethnic subgroup.

	Total sample	Asian	Black/African American	Hispanic	White
Total score	0.73**	**0.75****	0.73**	**0.73****	0.69*
Occupational knowledge subtest score	0.63**	0.60**	0.62**	0.60**	0.61**
English writing skills subtest score	0.64**	**0.70****	**0.66****	0.65**	0.57**
N	5078	457	390	539	3582

$^{*}p < 0.05$ and $^{**}p < 0.01$. Bolded values are statistically significantly different than White candidates ($p < 0.05$, one-tailed).

TABLE 5 | Likelihood of taking the actual test based on score on the practice test.

Percentile score on practice test	Percent subsequently taking actual test (%)
10	3.91
20	8.04
30	11.04
40	12.01
50	14.37
60	17.53
70	20.56
80	25.06
90	28.08
100	31.14
N	29,626

Note: Correlation between practice test total score and whether they subsequently took the actual test is 0.21 ($p < 0.01$).

$p < 0.001$) candidates who took the practice test had significantly greater differences in actual test scores than candidates from their racioethnic group who did not take the practice test as compared to White ($d = 0.09$) candidates. Finally, for the total actual test score, Asian ($d = 0.22$, $p < 0.001$) and Hispanic ($d = 0.28$, $p < 0.001$) candidates who took the practice test had significantly greater differences in actual test scores than candidates from their racioethnic group who did not take the practice test as compared to White ($d = 0.16$) candidates. Together, Hypothesis 3 is largely supported.

Hypothesis 4 predicted that the adverse impact on racioethnic minorities would be reduced for those who took the practice test compared to those who did not. While we are not able to report the actual adverse impact as these data are from an active selection system, we are able to report adverse impact ratio differences. As such, to test this hypothesis, we examine how adverse impact ratios change for those who take the practice test and those who do not. Table 9 shows increases in adverse impact ratios (thus reduced impact) for both Asian (by 0.07) and Hispanic (by 0.10) candidates, but not for Black or African American (0.01) candidates. In terms of practical outcomes, this increased the number of Asian candidates passing by 46 (10.0%), Black or African American candidates passing by 14 (3.5%), and Hispanic candidates passing by 50 (11.1%). Examination of the changes in passing rates revealed that the improvement appears to be due to greater increases for racioethnic minorities than racioethnic nonminorities (6.56% for White candidates) rather than just an increase in all passing rates causing the reduced ratios.

5.2 | Supplemental Analyses

We conducted supplementary analyses to explore three research questions. First, do racioethnic minorities engage in more of the other types of employment test preparation than racioethnic nonminorities. Although we could not use these as controls because the questions on other forms of preparation were only collected from those who took the practice test, such differences might shed light on why racioethnic minority candidates improved more. Table D (Supporting Information) includes a mean comparison of the preparation index by racioethnicity, which reflects the total number of types of test preparation. We see no difference between Black or African American candidates or Hispanic candidates and White candidates, but White candidates ($M = 2.94$, $SD = 2.09$) tended to participate in

TABLE 6 | Likelihood of having taken practice test based on score on total actual test by racioethnic subgroup.

Percentile Score on Actual Test	Total Sample	Asian	Black/African American	Hispanic	White
10	19.90%	19.91%	19.44%	19.90%	19.11%
20	21.40%	20.28%	22.97%	17.82%	22.49%
30	23.79%	21.58%	20.94%	22.10%	25.09%
40	28.56%	25.00%	27.62%	27.15%	29.15%
50	29.75%	**24.84%**	25.37%	**21.27%**	32.56%
60	29.20%	**21.67%**	**20.56%**	30.65%	30.50%
70	29.33%	30.36%	**19.77%**	25.15%	30.90%
80	32.19%	29.52%	37.70%	29.60%	32.68%
90	30.66%	33.33%	22.73%	31.39%	31.09%
100	31.04%	32.03%	34.15%	**39.50%**	30.39%
N	5,078	457	390	539	3,582

Note: Bolded values are statistically significantly different than White candidates ($p < 0.05$, two-tailed).

TABLE 7 | Relative score gains among racioethnic subgroups between the practice and actual tests.

	Differences in standard deviations (*d*) compared to white subgroup		
	Asian	Black/African American	Hispanic
Total score	0.18**	0.31**	0.06
Occupational knowledge subtest score	0.04	0.00	−0.12*
English writing skills subtest score	0.21**	0.43**	0.18**
N	457	390	539

Note: $N = 3582$ for White candidates. $^{**}p < 0.01$, $^{*}p < 0.05$ (one-tailed).

more preparation than Asian candidates ($M = 2.54$, $SD = 2.04$, $t(4,120) = -3.84$, $p < 0.001$, $d = -0.19$).

Second, do racioethnic minorities engage in less effective employment test preparation than racioethnic non-minorities? Whether a preparation activity is considered more or less effective can be determined by assessing the bivariate correlation with the actual test score. In Tables D and E (Supporting Information), we can see the correlation between whether or not a preparation type was used and the actual test total score for those who took the practice test. Five of the 10 activities share positive and significant relationships with the actual test total score: reviewing information on the organization website ($r = 0.04$, $p = 0.003$), reading books related to the test topics ($r = 0.05$, $p < 0.001$), taking courses related to the test topics ($r = 0.07$, $p = < 0.001$), obtaining job experience related to the test topics ($r = 0.09$, $p < 0.001$), and obtaining other (non-job) experiences related to the test topics ($r = 0.04$, $p = 0.01$). Of these, obtaining job experience and taking courses share the strongest, albeit still relatively small, relationships. The least effective strategies were using the test information guide ($r = -0.08$, $p < 0.001$) and seeking the advice of a recruiter ($r = -0.05$, $p = < 0.001$). Black or African American candidates were more likely than White candidates to engage in these two preparation activities. Moreover, White candidates were more likely to participate in the more effective tactics than most racioethnic minority subgroups including obtaining relevant job experience, taking additional courses, reading books related to the test topics, and reviewing information on the organization's website. Together, this suggests that racioethnic minority candidates were more likely to engage in less effective employment test preparation, and non-minorities were more likely to engage in more effective test preparation in this sample.

Third, do candidates who take the practice test differ in quality from those that do not? From a theoretical perspective, the impetus for practice tests is to help candidates who are less qualified receive feedback and prepare better, thus it would be useful to know whether instead highly qualified candidates are more likely to take the practice tests. Campion, Campion, and Campion (2019) faced a similar question, which they addressed with two analyses that we repeat here. First, we compared the means on the practice tests to the means for these tests when they were previously used as actual tests. In the current study, the mean for the occupational knowledge section of the practice test was slightly lower but the mean for the English writing section was slightly higher ($M_{\text{occupational knowledge}} = 47.70$; $M_{\text{English writing}} = 53.29$; compared to means of 50 on the T-scores when used as actual tests). Thus, there was not a clear trend. Second, we compared scores on a biodata questionnaire that was part of the actual test at that time, but not part of the practice test because biodata should not improve with practice. The biodata questionnaire measured planfulness, motivation, initiative, and other dimensions that may influence or reflect applicants' quality. It included 56 items rated on a 5-point scale that were T-scored

TABLE 8 | Differences in scores between actual test takers who took and did not take the practice test by racioethnic subgroup.

	Differences in standard deviations (*d*)				
	Total	**Asian**	**Black/African American**	**Hispanic**	**White**
Total score	0.19**	**0.22****	0.12*	**0.28****	0.16**
Occupational knowledge subtest score	0.13**	0.13*	**0.14****	**0.17****	0.09**
English writing skills subtest score	0.21**	**0.26****	0.07	**0.32****	0.19**
N took practice test	5078	457	390	539	3582
N did not take practice test	13,330	1357	1320	1670	8718

Note: $^{**}p < 0.01$, $^{*}p < 0.05$ (one-tailed). Bolded values are statistically significantly different than White candidates ($p < 0.05$, one-tailed).

TABLE 9 | Differences in adverse impact ratios on the actual test between those who took and did not take the practice test.

	Asian	**Black/ African American**	**Hispanic**
Differences in adverse impact ratios	0.07	0.01	0.10
Z-test	3.11**	0.35	4.22**
N took practice test	457	390	539
N did not take practice test	1357	1320	1670
Additional passing candidates (%)	46 (10.0%)	14 (3.5%)	50 (11.1%)

Note: $^{**}p < 0.01$, $^{*}p < 0.05$ (one-tailed).

($\alpha = 0.95$). We compared the average biodata scores for applicants who took the practice test ($M = 49.94$, $N = 5{,}078$) to the scores of all candidates ($M = 50.47$, $N = 18{,}408$) and found them to be slightly lower. Together, these results do not suggest that candidates who took the practice test were of higher quality.

6 | Discussion

The purpose of this study was to examine whether employment practice tests will benefit racioethnic minority applicant test performance by offering equal opportunities for candidates to prepare. We drew from the educational testing literature to formalize equal preparation opportunities via a series of hypotheses on how equalizing access to information and opportunity to perform can reduce subgroup differences in employment test scores. In a large diverse sample in an operational selection context using mental ability tests, we show that candidates who took the practice test scored higher on the actual test than those who did not, racioethnic minorities realized greater score gains than non-minorities and this reduced subgroup differences, which generally reduced adverse impact for racioethnic minorities who took the practice test compared to those who did not. We also found that racioethnic minorities experienced other benefits of practice testing—such as receiving an accurate estimate of their actual test scores and increasing the likelihood they will apply—equal to that of racioethnic nonminorities. Finally, we found that racioethnic minorities were more likely to participate in less effective preparation strategies such as using the information guide and speaking with a recruiter than racioethnic nonminorities, but that they were less likely to participate in the more effective strategies such as gaining additional job experience and taking courses related to test topics.

In all, the study constructively replicated the single previous study by Campion, Campion, and Campion (2019) on using practice tests in employment by showing (1) the findings replicated in subsequent samples and with all the larger racial subgroups (African American, Hispanic, and Asian), (2) the score gains reduced mean differences between subgroups, and (3) subsequent adverse impact (i.e., differences in passing rates) was reduced. This study also went beyond Campion et al. by developing an equalizing preparation opportunity theoretical framework to explain the phenomenon.

6.1 | Theoretical Implications

Our first contribution is to show how practice tests can be a valuable method to reduce subgroup differences. As noted, research shows that our strongest predictors of job performance tend to also display the largest subgroup differences that often result in adverse impact (i.e., mental ability tests; Schmidt and Hunter 1998; Sackett et al. 2022). This is a continuing challenge for researchers and practitioners as they have sought to resolve this tradeoff through a variety of strategies. Our finding that taking a practice test reduces mean subgroup differences in the actual test scores by creating greater score gains for racioethnic minorities complements and extends past research. The cause of this appeared to be that the passing rates for racioethnic minorities improved to a greater extent than for nonminorities, not just due to increasing the adverse impact ratios (reducing impact) because all passing rates were increased (rising tide effect). Importantly, this is a systems change rather than trying to change subjective biases, which the HR literature suggests might be more effective (e.g., Calluso and Devetag 2024).

We found that the greatest racioethnic minority benefit was for the English writing skill subtest. In previous research, scholars

have suggested that this may be because rules of English are easier to learn or relearn from brief practice, unlike the large body of knowledge required of these professions (Campion, Campion, and Campion 2019). Moreover, some racioethnic subgroups (e.g., Asian and Hispanic) may have learned English as a second language, and thus may begin with fewer language skills and therefore have more to gain. Although English language skills are an essential requirement of the jobs in the current setting, this finding highlights the potential for inadvertently increasing subgroup differences if the tests require language skills to be completed, but language skills are not required by the job.

Relatedly, our supplemental analyses highlighted notable subgroup differences. For example, racioethnic minorities were slightly less likely to take the actual test if they scored in the middle ranges on the practice test compared to racioethnic nonminorities, suggesting racioethnic minorities may need more encouragement to apply in situations where the outcome likelihood has greater uncertainty. Further, we observed differences in the use of other preparation techniques by racioethnic minority candidates. Educational testing scholars have found that racioethnic minorities may engage in more preparation (Devine-Eller 2012; Ho, Park, and Kao 2019), but that these preparation strategies may be the less effective ones (Alon 2010). We examined this in employment testing preparation and found it to hold in part. Racioethnic minorities took advantage of these other types of preparation at comparable rates to nonminorities, but there were some important differences. Racioethnic minorities reported somewhat less frequent usage of preparation types associated with slightly higher test scores—which tended to be more skill-building preparation (e.g., reading books or taking a class)—and greater use of those associated with slightly lower scores—which tended to be more informational preparation (e.g., reading an information guide or talking with a recruiter). This has been previously observed in laboratory studies of test-taking strategy predictors of cognitive test performance for Black or African American students (Dollinger and Clark 2012; Ellis and Ryan 2003). We extend this by showing the effect of various preparation types in an operational selection context. Such findings may reflect the relative ease of each type of preparation, which could influence the behavior of candidates who are less well-informed about preparation and highlight the value of providing advice as to the most effective strategies to all candidates to encourage equal preparation. These are screening-oriented recruiting practices, which help candidates determine whether they are likely to be successful and how to improve, the importance of which are described in the HR literature (e.g., Dineen and Williamson 2012).

Our second theoretical contribution is the formalization of equal preparation opportunities. We conceptualize practice tests as an important device through which potential candidates can equally access information and take advantage of an opportunity to perform. The central thesis is that unequal access to information on employment testing and opportunities to prepare for and perform in high-stakes testing offers insight into prevailing racioethnic subgroup differences on employment tests. The hiring process in most organizations is often perceived as extremely ambiguous for candidates. Essential to our theorizing, practice tests can be provided to all candidates ensuring equal access, unlike other informal avenues such as employee referrals, school contacts, or other common recruiting processes that may depend on social contacts not as available to racioethnic minorities (Ibarra 1993). Although there were some differences across analyses, candidates from all three large racioethnic subgroups (Asian, Black or African American, and Hispanic) realized greater improvements from practice tests than White candidates. This complements previous research on retesting, that showed nonminorities had larger gains (Schleicher et al. 2010; van Iddekinge et al. 2011). Following our equal preparation opportunity theorizing, the explanation for these divergent findings is that practice testing is offered equally to all candidates that are easily accessible, thus reducing any barriers such as the effort, resources, or passing prescreening required for retesting. Finally, practice testing demonstrates that racioethnic candidates are equally qualified, which is likely to be a more effective strategy for increasing the hiring of diverse candidates than HR strategies that rely on compliance or inclusion (e.g., Nkomo and Hoobler 2014; Ryan and Tippins 2004).

Finally, we extend our understanding of differences by race by looking at Asian- and Hispanic-White comparisons, in addition to Black or African American-White differences, which are much less studied. In particular, we contribute to the growing body of literature on Asian-White comparisons that may not follow the same pattern as other racioethnic subgroup comparisons. Although not considered a historically disadvantaged racioethnic minority subgroup in the United States, research shows this group also faces workplace discrimination (e.g., Jun and Wu 2021; Lai and Babcock 2013). Further, they are a large and growing part of the labor force, and additional research is needed. The current study finds that Asian candidates benefit as much or more than other racioethnic subgroups from practice tests. Similar to Asian workers, Hispanic workers have not received the same level of attention from scholars as Black or African American workers. While Hispanic test takers also benefited from practice tests, this was not always the case, again highlighting a different personnel selection experience than other subgroups in need of additional scholarship. Black or African American test takers benefited the most in score gains, but not in mean differences or adverse impact. This is potentially due to the special focus on recruiting Black or African American candidates by this organization, which may have encouraged more candidates with uncertain preparation to take the practice test. Being able to do outreach recruiting but not disappoint candidates who may not be ready to take the actual test was the initial impetus to develop the practice test in this organization.

6.2 | Practical Implications

Although some companies are providing more information on their hiring procedures (e.g., see links above to Heineken, Mayo Clinic, and also see Suzuno, 2019), there are several important practical implications from this research relevant to HR. As recommended by Nkomo and Hoobler (2014), practice tests seek to demonstrate that minority candidates are equally qualified as opposed to relying on compliance or inclusion as justifications. They focus on reducing subjectivity in the hiring process as rerecommended by Adamovic (2022). They are

"s-frame" interventions that modify systems rather than less effective "i-frame" interventions that focus only on reducing the subjectivity of individuals, which are less effective (Calluso and Devetag 2024). Practice tests convey screening-oriented recruiting messages that encourage candidate self-selection, as recommended by Dineen and Williamson (2012). Finally, practice tests focus on improving the number of qualified racioethnic minority candidates, which has a greater influence on reducing adverse impact than other methods (Ryan and Tippins 2004).

Our first recommendation is that organizations use practice tests to benefit both candidates and organizations. Candidates obtain accurate information on their likelihood of passing as well as information on how to prepare if they are not quite ready. Practice tests provide an opportunity to improve actual test scores, which increases the likelihood of being hired. Organizations recruit more qualified candidates and enhance the hiring of racioethnic minority candidates. The benefits for both parties are convenience and low cost. Potential candidates can take the practice test from their personal computers for free and at any time, and posting a retired test online only costs the organization the time to program. Moreover, the effect sizes were fairly large across the various analyses (with *d*'s averaging about 0.20 and often greater), suggesting the influence of this preparation tool could be meaningful. A *d* of 0.20 translates to an estimated increase of 8.63% in the likelihood of passing the actual test in the current study. These benefits are much greater than simply providing example tests and interview questions as many organizations already do, primarily because the candidates have the opportunity to experience the tests and receive feedback on their likelihood of passing.

Our recommendation is that due to the idiosyncrasies of employer tests, organizations are responsible for implementing practice tests. Although others such as professional associations or recruiting agencies might be able to provide practice tests in some circumstances (e.g., if there are common specific tests such as licensure and certifications tests, or the client shares the test with the agency), the organizations are usually the only ones who can do so for their unique tests. Practices tests, as we note, offer benefits to the organization by enabling them greater involvement in the curation of a qualified candidate pool, reducing subgroup differences in their assessments, and perhaps even being viewed as more fair given the transparency of practice.

We also note that contemporary organizations face other challenges, such as mounting stakeholder backlash to their diversity and inclusion programs (e.g., Ring 2024). Although we believe most large organizations still see diversity enhancement as a top priority (e.g., Howland 2024), especially government organizations as was the context of the current study, these other factors must be considered. However, we argue that practice tests level the playing field as they provide equal preparation opportunities for all candidates and may not be immediately viewed as a diversity-enhancing initiative. Not only do practice tests benefit candidates of all races as we show, but some candidates may not know how the hiring process works. This is true for candidates of all races, but perhaps more so for racioethnic minority candidates. Practice tests are an equal opportunity mechanism and not a form of affirmative action.

A second recommendation is to consider the use of practice tests to reduce adverse impact. Adverse impact is an important bottom-line outcome to organizations due to possible legal challenges when impact occurs. Impact improvement cannot be assumed based on score gains or even subgroup mean differences because it depends on many other factors such as number of hires, passing score, size and distributional characteristics of the racioethnic subgroups, voluntary withdrawals, and so on. We recommend that if reducing impact is one of the organization's goals that they first analyze these factors to estimate whether practice tests will reduce adverse impact. This can often be achieved by simulating the effects first. The improvement in adverse impact ratios in this study was meaningful (7%–10%), which is promising for other organizations. Moreover, practice tests do not require abandoning current tests or incurring the cost of developing new tests in order to reduce impact. In addition, taking a practice test does not reduce the validity of the scores and may even improve it (van Iddekinge et al. 2011), perhaps by reducing errors due to unfamiliarity with the test or test anxiety. So, they do not create a validity-impact tradeoff (Ployhart and Holtz 2008). This recommendation should not be as interpreted as using them only or even mainly for that purpose. The other benefits of practice tests such as improving candidate scores and increasing the number of qualified candidates to apply are important even if reducing impact is not a concern.

A third recommendation is to consider practice tests as potentially applicable to organizational contexts other than the one studied here. Although subject to future research, practice tests can conceivably be used by organizations of different sizes, industries, and types of assessments. The current organization was ideal because it had retired versions of past tests that could be used as practice tests. Organizations without retired tests could still create practice tests by using similar questions. Typically, there are spare questions left over from the test development process or that can be made up by modeling the actual test questions. The key is not just showing candidates illustrative questions, which some organizations already do (e.g., Mayo Clinic and Heineken as cited above), but providing a similar experience by taking a test with similar types of questions and receiving a score and the correct answers. This provides actual feedback as to their readiness much better than simply reviewing a few example questions, even if an estimate of passing cannot be provided. The practice test needs to only use similar questions and be long enough to provide a reasonably reliable measure. Mental ability tests might be the most important type of assessment for which to use practice tests because they often show adverse impact, but practice tests could be used with other assessments that either have a mental component or practice would likely improve performance such as situational judgment tests and assessment exercises like simulations and cases (if they have computer scorable answers like multiple choice as opposed to essay answers). Providing practice with feedback on self-assessments like personality tests is less necessary and may lead to increased exaggeration or faking (for potential strategies to reduce faking see Levashina, Morgeson, and Campion 2012; Fan et al. 2012).

A fourth recommendation is that organizations address subgroup-specific challenges in practice test uptake, such as

lack of awareness of their availability. For example, organizations can communicate to schools that prepare candidates for these jobs that such preparation is available, especially minority-serving colleges and universities, including mention of the practice tests in job advertisements, and ensure recruiters are aware and promote the practice tests. As noted, the development of this practice test came from college recruiters for this organization. Racioethnic minority candidates may need more directed communications that the organization is trying to equalize their preparation (Avery and McKay 2006).

Finally, we recommend that organizations also consider the other types of preparation that may be useful to candidates and provide those suggestions to candidates (for published examples in employment, see Chung-Herrera et al. 2009; Clause et al. 2001; Ryan et al. 1998). Candidates may not realize the various ways to prepare and providing suggestions will help. This is a natural complement to practice tests and might be incorporated into the website as the current organization did. We also recommend that organizations consider which other types of preparation are effective for their assessments and share that advice with potential applicants. Our finding that racioethnic minorities may use less effective preparation tactics is valuable in this regard (as also observed by Alon 2010, in education). Understanding preparation strategy patterns enables organizations to guide future applicants. When advising potential candidates, organizations should encourage them to focus their preparation on strategies that afford skill building in areas relevant to the job. For example, applicants for financial analyst positions should spend time learning the basic tenants of finance including data cleaning, financial formulas, and interpretation of results. These can be gained through formal avenues (coursework, employment) or informal avenues (self-teaching from available materials and volunteer activities). Understanding these various strategies and their pattern of use may not only highlight pathways for organizations to target recruitment efforts to inform racioethnic minority candidates about ways to prepare, but this advice can help all candidates and could be provided even if diversity is not the main goal.

6.3 | Limitations and Future Research

There are a number of ways in which future research could build from the limitations of the current study. First, future research might explore the various mechanisms underlying the value of practice tests other than providing equal access to information and practice. For example, based on signaling theory (e.g., Bangerter, Roulin, and König 2012), practice tests might be effective because they send signals to candidates about the knowledge and skill required to be a successful candidate and their likelihood of success if they apply much better than simply providing information. Based on human capital theory (e.g., Campion, Ployhart, and Campion 2017; van Hoye and Lievens 2009), an opportunity to perform a practice assessment might provide: (1) crucial diagnostic information to potential candidates on their level of necessary human capital and (2) an opportunity to build occupation-specific human capital before applying. Based on procedural justice theory (e.g., Bauer et al. 2001), practice tests may improve the perception of equal opportunity because information and opportunity to perform are core components of justice perceptions, and such perceptions influence outcomes such as test motivation, test anxiety, and applicant attraction (McCarthy et al. 2017).

Second, a question not examined in the current study is why some candidates will take the practice tests and other forms of preparation and how to encourage candidates to prepare. It is likely that individual differences play a role that is beyond the influence of the organization (e.g., conscientiousness, personal interest, motivation, ability). It is possible that organizations can do more to encourage preparation beyond making it available, which would be informed by future research that identifies why some candidates will take the practice test and others not.

Third, the underlying causes of why racioethnic minorities may engage in more of certain preparation activities and that those may be the less effective strategies requires additional research. While the practice test is equally available to all potential candidates, the other strategies vary in their accessibility. For example, obtaining additional job experience is a high-cost preparation activity that requires significant time and effort and is not available to everyone. Similarly, taking courses on job-related topics is also difficult if not potentially prohibitive. As such, future research should examine the accessibility of other preparation strategies and help develop innovative skill-development interventions similar to that of practice tests, such as online self-paced skill-building tutorials.

Fourth, we only examined the influence of practice tests on mental ability employment tests (of occupational job knowledge and English writing skills) due to the racioethnic subgroup differences commonly observed for such measures. However, future research should examine practicing for other types of selection procedures that capture a wider array of candidate knowledge, skills, and abilities such as applications and interviews. Subgroup differences may be smaller in these instances, to begin with, but the other benefits of practice tests are likely (such as improving scores and increasing the likelihood of skilled candidates applying) and the ubiquity of these procedures makes them an important focus for research. The high cost of scoring such procedures for practice purposes might be defrayed by the increasingly available artificial intelligence-based scoring of narrative data in employment (e.g., Campion et al. 2016; Campion and Campion 2020; Campion et al. 2024; Koenig et al. 2024; Sajjadiani et al. 2019).

Finally, future research should examine whether practice tests need to be a complete version of the assessment and provide an accurate estimate of the likelihood of passing, or whether a sample of items and other information about the procedure would suffice. Although we cited some recent exceptions, the provision of such information is not common in employment and no systematic research has examined its effectiveness in the published literature. Future research should also examine other types of preparation equalization approaches for candidates. The survey data collected in the current study showed some types of preparation were correlated with higher scores on the practice test and the actual test, such as studying about the organization on its website. However, they were only measured dichotomously post hoc, so examining their content in more detail and establishing

their causal importance, as well as their racioethnic diversity associations, might further enhance our understanding of the role of other types of preparation equalization.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Research data are not shared.

Endnotes

[1] We followed APA 7th Edition guidelines on referring to both racial and ethnic minorities as a group because the subgroups in our study represent races (Asian, Black, and White) and ethnicity (Hispanic). Guidelines can be found here: https://apastyle.apa.org/style-grammar-guidelines/bias-free-language/racioethnic-minorities.

[2] https://medium.com/@DutchDigital/design-case-heineken-go-places-a0b51ccac1bc.

[3] https://www.mayoclinic.org/documents/preparing-for-a-behavioral-interview/doc-20150425.

[4] https://www.greenhouse.com/blog/top-2019-talent-trends-candidate-experience.

[5] https://www.eeoc.gov/2023-annual-performance-report.

[6] It is worth noting that there are many well-known testing services offering aptitude or personality tests in the employment domain, but standardized preparation services are rare, if nonexistent.

[7] https://en.wikipedia.org/wiki/A_rising_tide_lifts_all_boats.

[8] The organization is considering moving to remote proctored testing in the future.

[9] Relevant labor market percentages were based on Bureau of Labor Statistics data on employment in comparable jobs throughout the government, consistent with recommended procedures for determining labor market availability for affirmative action goal setting from the U.S. Department of Labor, Office of Federal Contract Compliance Programs (2014).

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.